AUSTRALIAN MUSEUM SCIENTIFIC PUBLICATIONS

Fletcher, Harold O., 1932. A revision of the genus *Myonia*, with notes on allied genera from the Permo-Carboniferous of New South Wales. *Records of the Australian Museum* 18(8): 389–410, plates xlvii–l. [13 September 1932].

doi:10.3853/j.0067-1975.18.1932.744

ISSN 0067-1975

Published by the Australian Museum, Sydney

A REVISION OF THE GENUS *MYONIA*,[1] WITH NOTES ON ALLIED GENERA FROM THE PERMO-CARBONIFEROUS OF NEW SOUTH WALES.

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(Plates xlvii-l.)

INTRODUCTION.

A great deal of confusion exists over the status of many of our eastern Australian Permo-Carboniferous genera of Pelecypoda. This chaotic state is particularly pronounced in the genera described by J. D. Dana in 1847,[2] mainly *Cleobis*, *Cypricardia*, *Pyramus*, and *Myonia*, as well as other closely allied genera. Many of these forms were described from small series of not exceptionally well preserved specimens, and it is only to be expected that errors in synonymy, in a doubtful genus, will occur as time proceeds.

The Australian Museum collection of Permo-Carboniferous Pelecypoda has lately been augmented by the purchase of several large palæontological collections, consisting for the most part of the Varney Parkes and the John Mitchell collections, and these have considerably enhanced the working value of the collection on which this paper is based. This series, together with material and advice from Mr. W. S. Dun, Government Palæontologist of New South Wales and Lecturer in Palæontology at the University of Sydney, has enabled me to attempt to unravel these dubious genera. The plaster casts or replicas of Dana's type specimens obtained by the Australian Museum from the United States National Museum, Washington, have also been of material assistance in the compilation of this work.

The genus *Mœonia*, changed from *Myonia* by the author in 1849, will have to revert to the original name given to it in 1847. Dana does not give any reason why this change in nomenclature was made, and as there appears to be no valid reason why the name should be changed, the genus must be known as *Myonia*.

The present paper deals with the various Upper Marine species of the genus *Myonia* (as laid down in this paper), but it has been found necessary to bring into the discussion many allied genera, previously placed as synonyms of *Myonia* or *vice versa*. These genera I hope to deal with as time permits and at no distant date. Mr. W. S. Dun for some considerable time past has devoted a good deal

[1] J. D. Dana.—Amer. Journ. Arts and Sciences (2), iv, Nov., 1847, p. 158.
[2] J. D. Dana.—*Loc. cit.*, pp. 151-160.

of attention and work to the Lower Marine fauna of the Permo-Carboniferous, and those species of *Myonia* which occur in these beds have been described by him, and published as an addition to the present paper.

Status and Affinities.

A series of specimens from the Illawarra district of New South Wales was described by J. D. Dana in November, 1847,[3] and included in these were three new genera which he described as *Cleobis*, *Pyramia*, and *Myonia*. The publication in which Dana's original descriptions appear is not available to all workers in palæontology, and, as these have an important bearing on the subject, I have included them in this paper. Dana's original description and observations of his genus *Cleobis* is as follows:

"Shell inequivalve, inequilateral, thick, transverse sub-ovate, closed (or nearly so). Beaks large, salient and incurved. Posterior margin broadly rounded and a little dilated. Ligament internal. Hinge line flexed to one side at middle and passing beneath the lower of the beaks. Valves thin. Surface marked unevenly with regular concentric striæ of growth and without radiations.—This genus appears to be near the *Ceromya* of Agassiz;[4] but of this we cannot be certain, as the palleal and muscular impressions are not visible. There is much external resemblance to the *Avicula cuneiformis* of Verneuil (Russia, pl. xli). The beaks are prominent and incurved, but are not flexed at all forward; they project over or overhang the cardinal line, the summit being separated from it by an intervening space. The valves are quite thin, the thickness being less than a line in a large species measuring seven inches in length."

Three species were described and placed in this genus by Dana: *Cleobis grandis*, *C. gracilis*, and *C.? recta*; all from the Illawarra district of New South Wales.

The genus *Pyramus* Dana describes as follows:

"Equivalve, somewhat inequilateral, transverse, elliptical, with the front and posterior margins nearly alike, entirely closed; beak somewhat prominent. Ligament external. Palleal impression entire, distant from the margin. Three muscular impressions to each valve, two anterior and one posterior; the larger anterior, suborbicular, smaller anterior, facing the same way with the larger, and situated just above its upper angle; posterior faint. Surface marked with concentric lines of growth. Cast of summit of beak a slender point. Shape nearly of *Donacilla* and *Sanguinolaria*, but it differs in its entire palleal impression and has also two anterior muscular impressions which belong together to each valve, as in *Corbis*. From the impression of the hinge of a left valve there appear to be no prominent teeth; it has a very oblique shallow sulcus, directed posteriorly from the centre of the hinge, and a slight excavation anterior to the centre. The form is more transverse and the teeth less distinct than in *Corbis*. It has not the long lunate muscular impression of *Lucina*."

Two species were described by Dana on page 157, namely *Pyramus ellipticus*, from Harper's Hill in the Maitland district (Lower Marine series), and *P. myiformis*, from Illawarra (Upper Marine series) of New South Wales.

The third genus described by Dana and the one with which this paper is more directly concerned is *Myonia*:

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[3] Dana.—Amer. Journ. Arts and Sciences (2), iv, Nov., 1847, pp. 151-160.

[4] Agassiz.—Études crit. Moll. foss. (2), 1842, 25.

"Shell thick, oblong transverse, inequivalve, very inequilateral, much gaping behind. Palleal impression strong, entire. Muscular impressions three to each valve; two anterior and one posterior, all excavate, smaller anterior on the front, posterior on the rounded carina between the flank and lateral surface. Valves thick. Lateral surface strongly flattened at middle or even concave.—Resembles much *Panopæa* and *Pholodomya*, especially Agassiz's *Arcomya*;[5] but differs in its entire palleal impression, its second anterior muscle, as well as other characters."

Two species were described as belonging to this genus, *Myonia elongata* and *M. valida*, both Upper Marine forms from the Illawarra district of New South Wales.

In May, 1848, J. D. Dana,[6] in a paper on fossil fish and a new belemnite, adds a footnote on species that McCoy had re-described in his paper[7] published several months after Dana's. In this note he states that *Notomya* of McCoy corresponds to *Pyramus* of Dana, but he cannot believe they are related to the *Myidæ* as stated by McCoy. Dana considers that his three genera make a natural group among the Astartidæ, as they have the smaller anterior muscular impressions facing in the same plane as the larger anterior. They differ strikingly from *Astarte*, *Pachydomus*, *Astartila*, and *Cardinia*, according to the author, and, moreover, the larger anterior is prolonged upward towards the smaller anterior muscular impression and is pointed.

Dana points out that *Myonia* possesses a second, small, anterior, muscular impression, situated high up on the beak, and that the group *Cleobis* is characterized by not having the sides at all excavate. He considers the generic characters not distinctive enough, and apparently is of the opinion that all these forms should be included in one genus.

In the following year (1849), Dana,[8] in his more extended account of the geology of the Wilkes' expedition, follows his plan of the preceding year and groups the two genera *Pyramus* (now *Pyramia*) and *Cleobis* with *Myonia*, but still points out that, as some of the differences are very striking, they may form subgenera. A definite opinion is left for others, for, beyond describing subgeneric characters, he places all the species concerned in the genus *Myonia*, the species of *Pyramia* and *Cleobis*, therefore, being included under *Myonia*. *Notomya* of McCoy,[9] Dana considers a synonym of his *Pyramia*, which is *Myonia*, and in justification of this step Dana explains that, although McCoy considers his genus to bear relationships with the *Myidæ*, its resemblance is only superficial in external form, as there is no true sinus to the pallial impression, and they also possess two anterior muscles.

A species of the genus *Pachydomus* of Morris,[10] described two years before Dana's first published report appeared, is now involved in the difficulties surrounding the genus *Myonia*. The specimen figured as *Pachydomus carinatus* (figure 4, plate xi) is placed as a synonym of *Cypricardia sinuosa*, described in Dana's first preliminary report on the fossils, but now itself placed as a

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[5] Dana.—*Loc. cit.*

[6] Dana.—Amer. Journ. Arts and Sciences (2), v, May, 1848, pp. 434-5.

[7] McCoy.—Ann. Mag. Nat. Hist., xx, 1847.

[8] Dana.—U. S. Explor. Exped. (Wilkes') Geology, x, 1849, pp. 695-698.

[9] McCoy.—Annals Mag. Nat. Hist., xx, 1847, pp. 303-4.

[10] Morris.—Strzelecki's Phys. Descrip. of N.S.W. and V. Diemen's Land, 1845, p. 273, Pl. xi, f. 3-4

synonym of *Myonia axinia*. The other figured specimen of *P. carinatus* (figure 3, plate xi), Dana places in his genus as *Myonia carinata*.

The species of the genus *Myonia* and their synonymy finalized in 1849 has been compiled as follows:

Myonia elongata Dana.

Myonia elongata Dana, Amer. Journ. Arts and Sci., (2), iv, Nov., 1847, p. 158.

Myonia valida Dana.

Myonia valida Dana, *loc. cit.*, p. 158.

Myonia axinia Dana.

Cypricardia ? sinuosa Dana, *loc. cit.*, p. 157.

Pachydomus carinatus Morris (pt.), Strzelecki's Phys. Desc. of N.S.W. and V. Diem. Land., 1845, p. 273, pl. xi, fig. 4 (not fig. 3).

Myonia ? carinata (J. Morris) Dana.

Pachydomus carinatus Morris (pt.), *loc. cit.*, pl. xi, fig. 3 (not fig. 4).

Cypricardia rugulosa Dana, Amer. Journ. Arts and Sci., (2), iv, Nov., 1847, p. 157.

Myonia fragilis Dana.

Myonia myiformis Dana.

Pyramus myiformis Dana, Amer. Journ. Arts and Sci., (2), iv, Nov., 1847, p. 157.

Myonia elliptica Dana.

Pyramus elliptica Dana, *loc. cit.*, p. 157.

Myonia gigas (McCoy) Dana.

Pachydomus gigas McCoy, Annals Mag. Nat. Hist., xx, 1847, p. 301, pl. xvi, fig. 3.

Myonia grandis Dana.

Cleobis grandis Dana, Amer. Journ. Arts and Sci., (2), iv, 1847, p. 154.

Pachydomus globosus ? Morris and McCoy.

Myonia gracilis Dana.

Cleobis gracilis Dana, *loc. cit.*, p. 154.

Myonia recta Dana.

Cleobis recta Dana, *loc. cit.*, p. 154.

In this list of species it will be seen that Dana includes all the species of his genus *Cypricardia* of 1847 (*non* 1849), *Cleobis* and *Pyramia* as synonyms of *Myonia*. *Notomya* of McCoy, said by Dana to be a synonym of his *Pyramia*, is not mentioned in his synonymy as far as the species are concerned, and, as Stoliczka[11] later says: "Dana, although stating that McCoy's *Notomya* is identical with his *Pyramia*, does not mention which of the species belong to each of the subgenera, and from the description and the figures the reader will find it very difficult to arrive at anything like accuracy of determination."

Dr. Stoliczka criticizes Dana's nomenclature, and says that: "Great confusion exists among the fossils which have been described from the New South Wales Palæozoic (Carboniferous ?) rocks, and some of the specimens described as *Notomya* or *Mœonia* may just as well belong to *Pachydomus* or *vice versa*."

[11] Stoliczka.—Cret. Fauna S. India, Pal. Indica., iii, 1871, p. 83.

A distinction between *Pachydomus cuneatus* and *Myonia axinia* of Dana cannot be recognized by Stoliczka, who also states that such species as *Myonia valida* and *Myonia grandis* or *gigas* very improbably belong to the same genus, as the first are strong *Crassatella*-like shells and the others thin *Homomya*-like shells, and that more likely they belong to altogether different families.

In discussing the status of the genera, he concludes that from the characters of the shells it seems impossible to class them in any other genus than *Notomya*, and that McCoy was correct in pointing out the similarity of those shells to the Myæ. McCoy's characteristics are far more intelligible than those given by Dana of his *Myonia*, and therefore he thinks it advisable to accept his name.

De Koninck in 1877[12] possessed two specimens which he identified as Dana's *Myonia myiformis*, and for these he created a new genus *Clarkia*, which he placed intermediate in position between *Panopæa* and *Glycimeris*. He states that he is obliged to do this, as the true *Myonia* are carinated forms, with simple pallial impression and two-hinge teeth. In the same work W. B. Clarke describes a non-carinate form as a new species of *Myonia*, calling it *M. koninckı*. *Myonia elongata* and *M. gracilis* are described and figured in that genus, while the definitely carinated *Myonia ? carinata* of Dana is placed as a synonym of *Pleurophorus*.

R. Etheridge, junr., in 1878,[13] and again in 1880[14], offered a nomenclature as a temporary solution until some worker with a good series of specimens is able to throw more light on this question. Etheridge practically adopts Stoliczka's suggestion by accepting *Notomya* in preference to *Myonia* "because his description was more intelligible than Dana's and also because he correctly indicated the affinities of his genus". The species of *Myonia* are, according to Etheridge, now synonyms of *Notomya*, except *Myonia carinata*; this species is referred back to the genus *Pachydomus*.

The above nomenclature is followed eight years later by R. M. Johnston,[15] who dispenses altogether with the genus *Myonia*, placing all the species under *Notomya*, except *carinata*, which is still placed as a species of *Pachydomus*. *Mœonia koninckı* of Clarke is referred to the genus *Pachydomus*, and *Clarkia myiformis* still persists as a good genus.

Etheridge, junr.,[16] in 1892, writing on this subject, states that the arrangement adopted in his earlier papers was a purely provisional one, proposed more as a temporary suggestion than an accurate solution of a difficult and obscure subject. This author now writes that "a further study of this subject has not ended in any very satisfactory result, as the material in the National Collection, London, although large, is not sufficient for the purpose in view. Added to this, the discrepancies between the various descriptions are so marked that it becomes impossible to adjudicate on the relation of the species referred to the genera in question. *Pachydomus* and *Notomya* will probably stand as good genera, certainly the former, and it is quite possible that it will be necessary to some extent to rehabilitate *Mœonia* of Dana."

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[12] De Koninck.—Foss. Pal. Nouv-Galles du Sud, pt. 3, 1877, p. 283.
[13] Etheridge, junr.—Cat. of Aust. Fossils, 1878, pp. 72-73.
[14] Etheridge, junr.—Proc. R. Phys. Soc. Edinb., 1880, v, p. 300.
[15] R. M. Johnston.—Geology of Tasmania, 1888, pp. 114-115.
[16] Jack and Etheridge, junr.—Geol. and Pal. of Qld. and New Guinea, 1892, p. 282.

In re-establishing the genus *Mœonia*, Etheridge states that "this genus is provisionally used, pending a detailed examination of all those dubious Permo-Carboniferous bivalves, for shells after the type of *Mœonia elongata*". *Pachydomus carinatus* is placed as a synonym of *Mœonia carinata*, and in justification of this step Etheridge remarks that, although he formerly placed this species in *Pachydomus*, he now believes his reference and de Koninck's to the genus *Pleurophorus* to be erroneous, as the shell does not correspond with the original types of *Pachydomus*, such as *P. antiquatus* and *P. cuneatus*.[17] With regard to *Pleurophorus*, Etheridge says that he has quite failed to trace a dental structure in any casts of *M. carinata* examined, of which there are several good examples in the Australian Museum. *Myonia carinata*, in his opinion, is wholly devoid of hinge teeth, but possesses a peculiar system of muscle scars. These have been well figured by Felix Ratte,[18] showing double anterior and fringed muscle scars with accessory muscles at the apex of the beaks. These accord with the characters originally laid down by Dana for his genus *Mœonia*, and Ratte says: "I think it not improbable that this name will have to be retained for transversely elongate shells with the above characters typified by *Mœonia elongata* Dana and *Pachydomus carinatus* Morris."

Etheridge, junr.,[19] in 1919 described further specimens of these shells, strongly carinate and inflated types from the Lower Marine series of the Maitland district, New South Wales. *Mœonia morrisoni* and a small variety of *M. carinata* were described.

The presence of Australian generic forms in Carboniferous and Permo-Carboniferous beds beyond Australia has been referred to in a previous paper.[20] Other papers have since come to hand with new genera from North America and Brazil, which from a close examination of the figures and descriptions appear to be very closely allied to, if not identical with, some of our eastern Australian Permo-Carboniferous fauna. Several of these forms appear to have close affinities with the genus *Myonia*, and it is quite possible that several groups at present resting under various genera may have to be referred to the Myonidæ.

Faunal correlations at the present time are of particular interest and importance, and the discovery of a Permo-Carboniferous horizon in Brazil,[21] with a fauna having, according to Dr. Reed, nearest affinities with shells of the Lower and Upper Marine series of the Permo-Carboniferous of Australia, is of great interest.

The general fauna resembles markedly that of eastern Australia, but from the point of view of this paper interest lies mainly in two forms described as *Mœonia* cf. *cuneata* (Dana) and *Spathella tayoensis* Reed. Several species were relegated to *Spathella* by Hinde[22] in 1904 from the Carboniferous of England, and these with the Brazilian form may prove to have strong affinities with the Australian genus *Myonia*, although the muscle scars, according to Reed, appear to be a point of difference.

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[17] Sowerby.—Mitchell's Three Exped. into E. Aust., 1838, i, p. 15, pl. I, f. 2-3.
[18] Ratte.—Proc. Linn. Soc. of N.S.W. (2), ii, 1887, p. 139.
[19] Etheridge, junr.—Rec. Austr. Mus., xii, 1917-21, 9, p. 186, pls. xxviii-xxx.
[20] Fletcher.—Rec. Austr. Mus., xvii, 1, 1929, p. 2.
[21] Reed.—Monographias do Servico Geologico E Mineralogico do Brazil, x, 1930.
[22] Hinde.—Monograph of the Brit. Carb. Lamell., ii, 3, 1904, pp. 153-155.

Myonia cf. *cuneata* (Dana) described and figured by Reed appears to be certainly referable to the genus *Myonia*, and resembles very closely several species described in this paper from the Upper Marine series of the south coast of New South Wales. Before a definite opinion can be given on these relationships it is essential that specimens from these various localities be examined, and until these come to hand one can only venture suggestions from a close study of figures and descriptions.

A new genus of Pelecypoda which is closely allied to the Myonidæ is *Pleurophorella*, described by Girty[23] in June, 1904. This is a small strongly carinate type of shell from the Pennsylvanian rocks of Texas. Other genera from this locality have been compared with the Australian Permo-Carboniferous fauna, and it is quite possible that an interchange of specimens would prove these genera to have very strong affinities.

Summary of Conclusions.

After an exhaustive examination of a fine series of specimens and replicas of Dana's type specimens, together with his figures and descriptions, one can only conclude that there are three definite genera, as laid down by Dana in his preliminary report of 1847. The validity of these appeared doubtful to Dana, for in 1848 he reconsiders his characters of the previous year, and suggests that, if the characters he mentioned are not sufficient for generic distinction, they would probably be subgeneric. In 1849 Dana gives what he considers are his subgeneric characters, but, whether by accident or design, places all the species of his three genera in the genus *Mœonia*.

In my opinion, the subgeneric characters given by Dana, added to the shell proportions and outlines of these forms, which are entirely different, would form excellent generic differences and would make these three genera valid.

It is not my wish to go into details of other genera than *Myonia* in this paper, but at this stage I consider that *Cleobis* of Dana should be reserved for specimens after the type of the two original species, *C. grandis* and *C. gracilis*. These are comparatively large equivalve shells, very inequilateral, inflated and ovate. Beaks large, incurved, and hinge line overhanging. Posterior margin broadly rounded. No accessory anterior muscular scar. Lateral surface not compressed, but more or less bulging. Surface marked with coarse but regular concentric striæ or growth lines. Edentulous.

Cleobis recta referred to this genus is a doubtful species; it is a single specimen, not complete, and has been subjected to pressure which has caused distortion.

The consensus of opinion in regard to *Pyramia* is that it should be placed as a synonym of *Notomya* of McCoy, and this is also my contention. Dana, in 1848, in his note on genera re-described by McCoy, states that McCoy's article was published some months subsequent to his article on the same subject. According to the published dates, both papers appeared in print in November, 1847, but *Notomya* was selected to stand as it was better described and figured. According to the law of priority, *Pyramia* would become a synonym of *Notomya* in any case, as the genus was called *Pyramus* in 1847 and was changed to *Pyramia* in

[23] George H. Girty.—U. S. Nat. Mus., xxvii, 1904, p. 728, pl. xlv, figs. 4-6; pl. xlvi, fig. 5.

1848 by Dana. Dana states that these forms are similar to McCoy's specimens, and, according to his types, should be placed in the same genus as McCoy's *clavata* and *securiformis*.

The genus *Myonia* should, in my opinion, be reserved entirely for definitely carinated forms of large and small transversely elongated shells after the type of *Myonia elongata* of Dana and *Pachydomus carinata* of Morris. Dana, in 1848, was of the opinion that *Pachydomus gigas* of McCoy should fall into a group between *Cleobis* and *Myonia*, but this is only a large form of a carinated shell and is conformable to the description of *Myonia* without any modification of the generic distinctions.

Stoliczka and later Etheridge in his "Catalogue of Australian Fossils" were a little too sweeping in their change of nomenclature when referring all the species of *Mœonia* of 1849 to *Notomya* of McCoy, but no doubt this was a useful provisional method to adopt in keeping all the doubtful species together.

The genus *Clarkia* of de Koninck, created for his specimen of *Mœonia myiformis* of Dana, will no doubt be placed as a synonym of *Notomya* by some worker on that group, while *Mœonia koninckí* of Clarke was referred to *Pachydomus*, its correct genus, by Johnston in 1888. *Pachydomus carinatus* of Morris is definitely one of the most characteristic forms of the genus *Myonia*, and is quite distinct from *Pleurophorus* and *Pachydomus*.

The nomenclature accepted in this paper is one more or less adopted by Etheridge in 1892, and includes the following as good and valid genera: *Cleobis* of Dana, 1847; *Pachydomus* of Morris, 1845; *Notomya* of McCoy, 1847, and *Mœonia* of Dana, 1847. These genera are well represented in the Australian Museum palæontological collection by an exceptionally well preserved series of specimens. This paper is the first of a series on these Permo-Carboniferous Pelecypoda and deals with the genus *Myonia*.

A list of the described species which have been referred to it is as follows: Species from the Upper Marine series, Permo-Carboniferous.

Myonia elongata Dana.
Myonia valida Dana.
Myonia carinata (Morris).
Myonia gigas (McCoy).
Myonia corrugata, sp. nov.
Myonia depressa, sp. nov.
Myonia accentuata, sp. nov.
Myonia minor Etheridge.
Myonia minor var. *etheridgei*, var. nov.
Myonia undata (Dana).

Order MYACEA.
Family SAXICAVIDÆ.[24]
Genus Myonia Dana, 1847.

Myonia Dana, Amer. Journ. Arts and Sci., (2), iv, 1847, p. 158.

Mœonia Dana, U. S. Explor. Exped. (Wilkes'), Geology, x, 1849, p. 604.

[24] Changed by Iredale to *Hiatellidæ*, Rec. Austr. Mus., xvii, 9, 1930, p. 406.

Generic Characters.—Shell definitely transversely elongated and variable in size, ranging from 45 mm. to 200 mm. Inequivalve; very inequilateral, the beaks situated in the anterior one-third to one-fourth of the shell. Shell inflated in posterior two-thirds of valves. Beaks (in casts) terminate sharply; more or less tumid in complete shell, recurved slightly posteriorly and overhanging hinge line. Shell may gape slightly at posterior extremity. Ligament strong, external. A well marked oblique sinus or depression originates at the base of the beaks and reaches the ventral margin, in many cases in the posterior half of the shell. At its junction with ventral margin a concavity is formed; ventral margin otherwise straight, rounded at extremities to form a rounded anterior margin and varying from a pointed to a rounded posterior extremity or margin. An oblique keel or carina originating at the apex of the beaks extends to the posterior extremity of the ventral margin. Carina always well defined, sharp or rolled, and dividing posterior two-thirds of valve into two portions. The larger lateral portion usually strongly convex; a smaller dorsal portion, flattened and rising slightly towards junction of valves to form ligamental ridge. Anterior third of valves compressed.

Muscular impressions usually three to each valve, two anterior and one posterior; occasionally in some species two posterior, all excavate. Larger anterior adductor muscular impression is oval to diamond-shaped, being pointed above and only slightly pointed below. The inner surface of the larger muscle scars definitely fringed. Small anterior accessory muscle scar, situated above larger anterior, both facing the same way, towards the beaks. Posterior muscle scar large and oval. A smaller posterior muscle scar is sometimes visible in juxtaposition. Pallial line entire, extending from anterior to posterior scars, without sinus, and some distance from ventral margin. Hinge line small, straight. Edentulous.

The shell ornamentation or sculpturing usually consists of well-marked, fairly even, concentric striæ or growth lines. These follow the shell outline and at the carina form almost a right angle to cross the flattened postero-dorsal surface. Internal casts have a nodulose flank, the surface above the pallial line being covered with irregular tubercles. Smooth below pallial line. Shell comparatively thick.

Observations.—The main distinction of the species of the genus *Myonia* is the presence in all of the definitely marked ridge or carina, and the oblique sinus which separates the valve into a more or less compressed anterior one-third to one-fourth, and an inflated or swollen posterior portion. The affinities of this genus have been somewhat in doubt, as Dana in 1847 placed *Myonia* in close affinity with forms belonging to the family Anatinidæ, order Myacea. In 1848 the same author referred it to the Astartidæ, order Lucinacea. Stoliczka, *loc. cit.*, places this group as *Notomya* of McCoy in the family Saxicavidæ, order Myacea. Etheridge, later re-establishing the genus *Mœonia*, follows Stoliczka's classification and places it in the Saxicavidæ. If these shells are to be referred to this order they will have to form a group in which the valves are only slightly gaping posteriorly, in which the pallial line is continuous, and a sinus does not occur. At the present stage it is advisable to leave the genus in its present classification.

Myonia elongata Dana.

(Plate xlvii, figures 1–3.)

Myonia elongata Dana, Amer. Journ. Arts and Sci., (2), iv, 1847, p. 158.

Mœonia elongata Id., U. S. Explor. Exped. (Wilkes') Geol., x, 1849, p. 695, pl. v, fig. 3.

Description.—J. D. Dana, in his preliminary report in 1847, gives the following original description of this species:

"Thick, right valve rather the larger; greatest height half the length; gradually narrowing behind the beak, inferior margin just posterior to middle somewhat concave, carina from beak to posterior angle broadly rounded, not bent; flank flat, cardinal area long and circumscribed; surface strongly marked unevenly with regular striæ of growth. Length 6⅓ inches; height 53/100ths L.; thickness 42/100ths L.; anterior part about half the posterior; apical angle 145°. Illawarra."

This is the type species of the genus. It is an unmistakable form, and is represented in the Australian Museum collection by a very fine series from which additional characters have been secured.

Shell twice as long as high, transversely elongated, equivalve and inequilateral, the beaks situated in the anterior one-fourth of the shell. Upper and lower valve margins subparallel. Beaks definite, slightly recurved posteriorly and overhanging the hinge line. Hinge line straight and short. A definite and distinct ridge or carina originates at the apex of the umbone and extends obliquely to the posterior extremity of the valve. On internal casts the ridge is sharp, on testiferous specimens slightly rolled. A sinus or depression arises at base of umbo and extends very obliquely to the inferior margin. At junction the margin is incurved slightly, making a slight concavity on the otherwise straight ventral margin. Posterior two-thirds of shell inflated, the inflation beginning at the sinus and extending towards the umbonal ridge, at which point the shell attains its maximum width. Dorsally the shell area between the ridge or carina and the valve junction is flattened, rising slightly to form a ligamental ridge at the junction. Pallial line thick and entire.

Muscular impressions on well preserved specimens show one large posterior and three anterior scars. The large anterior scar is rounded dorsally and pointed below, extending to a small accessory muscle scar. A second, small, rounded, accessory adductor scar is situated above the larger and in juxtaposition with it. The posterior adductor muscle scar is situated on the flattened postero-dorsal slope of the shell; large and oval. Inner edge of superior anterior muscle scar is heavily fringed.

Shell ornamentation or sculpture is not a strong feature, consisting of closely packed striæ or growth lines. Test comparatively thick. Surface of internal casts in many specimens nodulose above the pallial line, smooth below. Edentulous.

Dimensions.—

	Plate xlvii.		
	Fig. 1. (F.8232.)	Fig. 2. (L.669.)	Fig. 3. (F.21716.)
Length	198 mm.	155 mm.	161 mm.
Height	84 mm.	86 mm.	88 mm.
Angle of ridge	25°	30°	30°
Width (both valves)	87 mm.	69 mm.	88 mm.

Observations.—This species is restricted to the Upper Marine series, all the known specimens having been collected from the Illawarra district, south coast of New South Wales. A certain amount of variety is noticeable in a large series of specimens, due more to distortion and stresses during preservation than to varietal differences in the shell itself. De Koninck[25] described a form from the red sandstone at Wollongong, south coast of New South Wales, which he decided was *M. elongata.* This specimen agrees with a series described as *M. accentuata* in this paper, and has been placed as a synonym. This form differs from *M. elongata* in the sharp and pointed posterior extremity and the straight umbonal ridge. The members of the group as a whole are smaller than *M. elongata.*

Localities.—Bundanoon Gully, Wollongong, Gerringong, Kiama, Kioloa, Jamberoo, and Black Head, all in the Illawarra district of New South Wales.

Horizon.—Upper Marine series, Permo-Carboniferous.

Figured specimens.—Australian Museum collection.

Collection.—Australian Museum and Mining Museum, Sydney.

Myonia valida Dana.

(Plate xlviii, figures 1–3.)

Myonia valida Dana, Amer. Journ. Arts and Sci., (2), iv, 1847, p. 158.

Mœonia valida, idem, U. S. Explor. Exped. (Wilkes') Geol., x, 1849, p. 695, pl. 5, fig. 3.

Description.—The only description of this species to my knowledge is the original one by Dana, and is as follows:

"Thick, very inequilateral, oblong, length somewhat less twice the height, rather rapidly decreasing in height posteriorly, and obliquely truncate behind, strongly carinate, with the flank (in cast) flat and broad and bent at the posterior muscular impression. Left valve slightly highest. Sides obliquely excavate, inferior margin excavate. Large muscular impressions with strong vertical erosions; the larger anterior produced upward nearly to the smaller anterior. Accessory muscular impression on front of beak. Palleal impression very strong, with delicate vermiform erosions running upward from it, and others (attachment of muscular fibres) scattered over the lateral surface. Length of cast 6 inches; height 58/100ths L.; thickness 45/100ths L.; apical angle of cast 120°."

This species has the general form of *M. elongata* Dana, but is a much blunter form, the greatest height being less than half the length. The oblique sinus which arises at the base of the umbone is very definite (particularly in the casts), and at its junction with the inferior margin forms a deep excavation. Posterior two-thirds of shell blunt and inflated, anterior one-third more or less compressed. The characteristic ridge or carination, extending from the apex of the umbone to the posterior extremity of shell, is conspicuous and arched. The ridge bends at the posterior muscle scar and meets the inferior margin at a comparatively steep angle.

The anterior muscular impression is large and oval, extended dorsally towards a smaller accessory muscle scar, rectangular in shape. Posterior scar large and oval, situated mainly on the flattened postero-dorsal slope, but with a slight extension on the flank of the shell. A smaller posterior muscle scar is situated

[25] De Koninck.—Foss. Pal. Nouv-Galles du Sud, pt. 3, 1877, p. 142, pl. xx, fig. 6.

a little above the main scar, oval in shape. Muscle scars are directed towards umbones. Scars heavily striated. Pallial line thick and entire, situated well in from the inferior margin. Flank of casts nodulose as in the above species, smooth below the pallial line.

Ornamentation of test consists of fine closely packed striæ with occasional heavy folds or growth lines.

Dimensions.—

	Plate xlviii.		
	Fig. 1. (F.8206.)	Fig. 2. (F.2096.)	Fig. 3. (L.657.)
Length	142 mm.	137 mm.	146 mm.
Height	87 mm.	82 mm.	92 mm.
Angle of ridge	35°	35°	35°
Width (both valves)	78 mm.	64 mm.	67 mm.

Observations.—This species was originally described from a single cast of this species and to my knowledge has not been mentioned in literature since 1849. A small series of exceptionally fine specimens is represented in the Australian Museum collection, including both internal casts and testiferous shells. It is a particularly characteristic form and easily distinguished by its blunt appearance, high flanks, and by the beaks being situated in the anterior one-third of the shell. It resembles *M. elongata* of Dana to a certain extent, but may be easily separated by the above characters, and the fact that the ridge is decidedly curved. Its height in relation to length is also a distinctive feature in this species.

Localities.—Black Head; Kiama; Flagstaff Hill, Wollongong; Illawarra district, south coast of New South Wales.

Horizon.—Upper Marine series, Permo-Carboniferous.

Figured specimens.—Australian Museum collection.

Collection.—Australian Museum and Mining Museum, Sydney.

Myonia accentuata, sp. nov.

(Plate xlvii, figures 4–5.)

Mœonia elongata de Koninck (not *elongata* Dana), Foss. Pal. Nouv-Galles du Sud, pt. 3, 1877, p. 142, pl. xx, fig. 6.

Description.—Shell of comparatively large size, transversely elongated and from twice to two and a half times as long as high. Equivalve; strongly inequilateral, the umbones situated in the anterior one-fourth of the valves. Hinge line straight and not of great length. Valves greatly convex, particularly inflated in the posterior portion, gradually diminishing towards the anterior margin, which is more or less compressed. A sinus or groove arises at the base of the umbone and excavates the shell obliquely towards the ventral margin. At its point of junction with the inferior margin a concavity breaks the otherwise straight margin. The posterior extremity of shell sharp and pointed; anterior margin rounded. Beaks blunt, pointing posteriorly and overhanging the hinge line. Originating at the apex of the umbone a ridge or carina extends at a low angle to the posterior extremity of the valve, terminating in practically a point. Ridge is exceptionally sharp and distinct, dividing the shell at its most inflated part into two areas, a lateral convex area and a flattened postero-dorsal area. At the valve

junction the shell rises to form a ligamental ridge. Shell slightly gaping at posterior margin. On flattened surface of shell a second subsidiary carina or swelling begins from the posterior end of the escutcheon. Shell material thin.

The ornamentation or shell sculpture consists of fine concentric striæ superimposed on coarser growth lines. Absence of internal casts prevents the elucidation of the musculature system.

Dimensions.—

	Plate xlvii.	
	Fig. 4. (F.1118.)	Fig. 5. (F.2472.)
Length	133 mm.	161 mm.
Height	62 mm.	63 mm.
Angle of ridge	—	20°
Width (both valves)	74 mm.	65 mm.

Observations.—This species is represented by a series of four specimens which form a definite type. De Koninck's[26] specimen figured and described as *M. elongata* of Dana has been placed as a synonym of this species, as it agrees in all details. The extreme sharpness of the posterior extremity and its length in comparison with height makes this an outstanding form. *M. elongata* and *M. valida* of Dana are the only two species of the genus which resemble it in any way, and these are easily separated by the following major characters:

(1) *M. elongata* and *M. valida* have a rounded posterior extremity, whereas in *M. accentuata* the posterior extremity is sharp and pointed.

(2) In *M. accentuata* the umbonal ridge is straight; in *M. valida* is arched strongly near the inferior margin, and in *M. elongata* is slightly concave.

(3) Shell proportions are entirely different. *M. accentuata* is a grossly elongated type; *M. valida* is a little longer than high, and *M. elongata* is twice as long as high.

Localities.—Gerringong Cliffs and Conjola, Illawarra district of New South Wales.

Figured Specimens.—F.2472 holotype (Mining Museum, Sydney), F.1118 paratype (Australian Museum Collection, Sydney).

Collection.—Australian Museum and Mining Museum, Sydney.

Horizon.—Upper Marine series, Permo-Carboniferous.

Myonia carinata (J. Morris).

(Plate xlix, figures 1–3.)

Pachydomus carinatus Morris, Strzelecki's Phys. Desc. of N.S.W. and V.D. Land, 1845, p. 273, pl. xi, fig. 3 (not fig. 4).

Cypricardia rugulosa Dana, Amer. Journ. Arts and Sci., (2), iv, 1847, p. 157.

Pachydomus carinatus McCoy, Ann. Mag. Nat. Hist., xx, 1847, p. 301.

Mœonia ? carinata Dana, U. S. Explor. Exped. (Wilkes'), Geology, x, p. 696, atlas, pl. 6, fig. 1.

Pleurophorus ? carinatus de Koninck, Foss. Pal. Nouv-Galles du Sud, pt. 3, 1877, p. 283, pl. 19, fig. 8.

Pachydomus ? carinatus Etheridge, Proc. Roy. Phys. Soc. Edin., vi, 1880, p. 300, t. 16, f. 53.

[26] De Koninck.—Foss. Pal. Nouv-Galles du Sud, pt. 3, 1877, p. 142, pl. xx, fig. 6.

Notomya (*Mœonia*) *elongata* Ratte (*non* Dana), Proc. Linn. Soc. N.S.W., ii, 1, 1887, p. 139, pl. 3.

Mœonia carinata Jack and Etheridge, Geol. and Pal. of Qld. and New Guinea, 1892, p. 283.

Description.—This is a transversely elongate shell, comparatively oval and convex. Beaks situated in the anterior one-third of the valve, recurved slightly posteriorly. Anterior margin of shell rounded, merging with the convex inferior margin; posterior wedge-shaped to rounded. An oblique sinus or depression originates at apex of umbones and extends to the ventral margin, which is incurved at the junction to form a concavity. This depression divides the shell into two portions, an anterior one-third, compressed, and a posterior two-thirds, inflated but not strongly. A strongly marked umbonal ridge arises at the umbone and extends to the posterior extremity at a very oblique angle. Postero-dorsal slope, between ridge and ligament, slightly flattened. Hinge line straight and short. Ligament external. Inferior margin arcuate, almost straight.

Muscular impressions excavate. Anterior adductor muscle scars two in number, consisting of a large oval scar, fringed on the inside, and a smaller accessory scar situated dorsally. Posterior muscle scar situated on postero-dorsal surface. Above the larger scar a small muscle scar is in juxtaposition. Pallial line thick and entire, uniting the two larger scars, situated a good distance from the inferior margin. Internal casts nodulose on the flanks above the pallial line.

Dimensions.—

	Plate xlix.		
	Fig. 1. (F.13840.)	Fig. 2. (F.2471.)	Fig. 3. (L.660.)
Length	98 mm.	87 mm.	62 mm.
Height	61 mm.	46 mm.	40 mm.
Width (both valves)	—	31 mm.	—
Angle of ridge	35°	34°	35°

Observations.—This is an unmistakable and one of the most characteristic species of the genus *Myonia*. It was first described by Morris in 1845 as a species of *Pachydomus* and later placed in its correct genus by Dana in 1849. Since then it has been placed in more genera than any other species of the genus. The strongly marked carination, particularly in internal casts, makes this form easily recognizable. It is represented in the Australian Museum by a large series of well-preserved specimens from the Upper Marine series, showing perfect musculature and testiferous shells showing ornamentation. This consists of concentric striæ, fine and closely packed, with occasional heavier folds. This species resembles *M. valida* to a certain extent, but differs in the smaller size and flattened flanks. The beaks are also not situated so far anteriorly. The distinct sharp carination is also characteristic.

Localities.—Illawarra district, Wollongong, Wandrawandian, Bundanoon, Gerringong, Jamberoo, Burrier, Shoalhaven River, south coast of New South Wales; Branxton, Maitland district. Coral Creek, Bowen River below Sonoma Road Crossing, Queensland. Port Arthur, Tasmania.

Horizon.—Middle or Marine series, Bowen River Coal Field, and Upper Marine series, Permo-Carboniferous.

Figured specimens.—F.2471, Mining Museum collection; L.660 and F.13840, Australian Museum collection, Sydney.

Collections.—Australian Museum and Mining Museum, Sydney.

Myonia gigas (McCoy) Dana.

(Plate xlix, figure 7).

Pachydomus gigas McCoy, Ann. Mag. Nat. Hist., xx, 1847, p. 301, pl. xvi, fig. 3.

Mœonia gigas (McCoy) Dana, U. S. Explor. Exped. (Wilkes'), Geology, x, 1849, p. 697.

Pachydomus gigas (McCoy), de Koninck, Foss. Pal. Nouv-Galles du Sud, pt. 3, 1877, p. 136.

Description.—Shell large, half again as long as high, very inequilateral, equivalve. Umbones situated in the anterior one-fourth of the valve. Shell compressed with wide flanks. Shallow sinus originates on the surface of umbone and extends obliquely to the inferior margin, where it joins with a slight concavity on the margin. Anterior margin of valve rounded and compressed. Posterior margin rounded and slightly inflated; greatest inflation posterior to the umbones; inferior margin straight. Umbonal ridge or carination is distinct but not sharp, extending obliquely and slightly arching towards posterior extremity, where it merges with valve.

Shell surface comparatively smooth, ornamentation consisting of fine concentric striæ with heavier growth folds or ridges.

Dimensions.—

	Plate xlix. Fig. 7. (F.30224.)	F.2468.	L.1421. (McCoy's type.) Cast.
Length	191 mm.	157 mm.	145 mm.
Height	108 mm.	96 mm.	102 mm.
Angle of ridge	55°	45°	—
Width (single valve)	35 mm.	38 mm.	84 mm.

Observations.—In the original description of this species McCoy mentions its great width in proportion to length; the flattened compressed sides of the posterior slopes; the oblique truncation of the posterior end, and the smallness and narrowed appearance of its anterior end. Dana in his description of 1849 mentions that a carina is present but not distinct, and places it as a synonym of his *Mœonia*. De Koninck in 1877 places this species in the genus *Pachydomus*, with no mention of a carina in his specimen, but says it was in a very bad state of preservation and did not allow him to give any of its characteristics or even dimensions.

According to a plaster cast of McCoy's type specimen, the shell is inflated, with convex to flattened flanks. A ridge or carina is present, and is arched as in *M. valida* of Dana. The postero-dorsal slopes are narrow and flattened, rising at the junction of the valves to form a ligamental ridge. A deep lunule is present with a shallower escutcheon. The flank excavation is narrow and shallow.

This species is quite unlike any other species of the genus on account of its large size, shallow sinus, and height in relation to length.

Localities.—Jamberoo, Wollongong, south coast of New South Wales.

Horizon.—Upper Marine series, Permo-Carboniferous.

Figured specimens.—Australian Museum collection.

Collection.—Australian Museum, Sydney.

Myonia corrugata, sp. nov.

(Plate 1, figures 3–4.)

Description.—Shell of large size, not exceeding 160 mm. Transversely oval, very convex and heavy. Equivalve and extremely inequilateral; umbones situated very anteriorly, the apex of the umbones almost projecting beyond the anterior margin. Beaks recurved anteriorly and overhanging hinge line. Anterior margin rounded; internal casts show deep concavity between apex of the umbones and the anterior adductor scar, which is raised considerably from the valve. Valve flanks very inflated, with a slight sinus originating on the flattened surface of the umbone and extending almost parallel with ridge to the inferior margin, where a slight concavity at the junction breaks the otherwise straight margin. Posterior margin spatulate, extensive, and rounded, wider than anterior portion of valve. A distinct and heavy umbonal ridge or carina originates at the apex of the umbone and extends to the inferior margin, not quite to the posterior extremity.

Musculature system consists of two anterior and one posterior scar. The large anterior adductor muscle scar is roughly diamond-shaped, directed in same general direction as umbones. Raised some distance from valve on internal casts. A smaller anterior adductor muscle scar is situated above the large scar and is attached by a prolongation of the most dorsal point of the large adductor scar. Posterior adductor muscle scar large, situated on the wide flattened postero-dorsal slope. Pallial line thick and deeply marked; entire, uniting both large scars.

Shell ornamentation or sculpturing consists of heavy concentric striæ, widely spaced and sharp.

Dimensions.—

	Plate 1.		
	Fig. 3. (F.30014.)	Fig. 4. (F.2478.)	F.2469.
Length	132 mm.	133 mm.	160 mm.
Height	77 mm.	76 mm.	111 mm.
Width (both valves)	26 mm.*	—	43 mm.
Angle of ridge	42°	45°	50°

Observations.—This most peculiar species of the genus is quite unlike any other. It is a form of the Upper Marine series and one that cannot be mistaken.

The following characters make it easily distinguishable:

(1) Extreme inequilateral outline of the shell.
(2) Large and raised anterior adductor muscle scar on the internal casts.
(3) Extreme convexity and heaviness of shell.
(4) Broad rounded posterior margin, large postero-dorsal slopes and heavy ornamentation unlike that of any other species.

Localities.—Millfield, Wyro, near Ulladulla, Conjola, south coast of New South Wales.

Horizon.—Upper Marine series, Permo-Carboniferous.

Figured specimens.—F.30014 (Holotype), Australian Museum collection; F.2478 (Paratype), Mining Museum, Sydney.

Collection.—Australian Museum and Mining Museum, Sydney.

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* Single valve.

Myonia depressa, sp. nov.

(Plate xlviii, figures 4–5).

Description.—Shell (without umbones) more or less oval in outline, the anterior margin being rounded similarly to the posterior margin. Inequivalve and inequilateral, the umbones situated in the anterior one-third of the valve. Umbones flattened but prominent, slightly overhanging hinge line. Hinge line short and straight. Umbones recurved slightly pointing posteriorly. Inferior margin straight, slightly arcuate in the median position. A wide and distinct sinus originates at base of umbone and extends obliquely to the ventral margin. Lateral slopes of flanks of valve flattened and compressed, being uniformly convex at posterior and anterior ends. A definite ridge or carina extends obliquely from the apex of the umbones and extends to the posterior extremity, where it merges with the shell. Sculpture or shell ornamentation consists of flattened striæ or growth ridges, following the shell outline.

Dimensions.—

	Plate xlviii.		
	Fig. 4. (F.30314.)	Fig. 5. (F.2466.)	F.21731.
Length	123 mm.	150 mm.	131 mm.
Height	70 mm.	80 mm.	74 mm.
Width (both valves)	24 mm.	—	22 mm.
Angle of ridge	40°	42°	40°

Observations.—This species is represented by a comparatively large series of specimens from the Illawarra district of New South Wales. The majority are from the Upper Marine sandstones at Kioloa and Termeil, and as a result the preservation is not exceptionally good and no internal casts are represented. Its oval outline, compressed lateral slopes and the shell sculpturing make this form unmistakable.

Localities.—New South Wales: Bundanoon; Kioloa; Termeil; Ulladulla; Gerringong; Illawarra district.

Horizon.—Upper Marine series, Permo-Carboniferous.

Figured specimens.—F.2466 (Holotype), Mining Museum collection; F.30314 (Paratype), Australian Museum collection.

Collection.—Australian Museum and Mining Museum, Sydney.

Myonia minor Etheridge fil.

(Plate xlix, figures 4–6; Plate xlviii, figures 6–7.)

Mœonia fragilis Dana (pt.), U. S. Explor. Exped. (Wilkes'), Geology, 1849, pp. 696–7; atlas, pl. vi, fig. 3.

Mœonia carinata Morris var. *minor* Etheridge, Rec. Aust. Museum, xii, 9, 1919, p. 187, pl. xxix, figs. 5–8.

Description.—Shell of comparatively small size, not exceeding 58 mm.; transversely sub-oblong, equivalve and inequilateral. Length half again as long as high. Umbones highest points of shells, pointed, directed posteriorly and overhanging hinge line. Hinge line straight and short. Valves convex on flanks, becoming strongly inflated posteriorly and slightly compressed anteriorly. Umbonal ridge or carina exceptionally distinct, strong and sharp. Originates at the extreme apex of umbone and extends obliquely to the posterior inferior extremity. Posterior

portion of shell wedge-shaped; anterior portion rounded. Inferior margin of shell gently rounded; a shallow median sinus extends from base of umbone to the ventral margin, where a slight concavity marks the junction. Lunule small and deep; escutcheon distinct, deep and elongate. Musculature not shown on specimens.

Surface ornamentation of valves consists of wide lamellæ or growth ridges, with fine indistinct concentric striæ superimposed.

Dimensions.—

	Plate xlix.			Plate xlviii.
	Fig. 4. (F.13939.)	Fig. 5. (L.661.)	Fig. 6. (F.30223.)	Fig. 6. (F.30313.)
Length	57 mm.	48 mm.	58 mm.	33 mm.
Height	31 mm.	29 mm.	35 mm.	16 mm.
Width (both valves)	11 mm.*	—	18 mm.	12 mm.
Angle of ridge	42°	42°	40°	30°

Observations.—This Upper Marine form of *Myonia* is the smallest in the series. Originally described by Etheridge as a variety of *M. carinata* Morris, but as a further series of specimens show no digression in size or characters, I have elevated the variety to specific rank. *Mœonia fragilis* Dana (part) has been placed as a synonym of this species. Dana in his atlas[27] figured two specimens, a large specimen (Plate vi, figure 2), and a smaller specimen (figure 3). A plaster cast or replica of figure 3 is in the Museum collection and agrees in every detail with the present species, as far as exhibited characters are concerned, but it is by no means a perfect specimen. Dana in his description of *M. fragilis* gives the dimensions of a comparatively large shell, more than twice the size of the specimen (Plate xlix, figure 4, of this paper) now placed as a synonym of *M. minor*. The rounded posterior margin of the small specimen and the arched ventral margin do not agree with the description of *M. fragilis*.

The extreme angle of the ridge in this species gives the shell a short or "stumpy" appearance, which, together with its small size, makes it an easily recognizable form.

Included with this species is a small series of specimens after the style of the two figured on Plate xlviii, figures 6 and 7. These are exceptionally well preserved specimens of testiferous valves which appear to compare well with *Pleurophorella papillosa* of Girty[28] from the Pennsylvanian rocks of Texas. The description and figures of this species agree perfectly with this smaller series of specimens, and I have no doubt that they must have strong affinities. No internal casts are in the collection, so that the musculature and other internal structures cannot be described. In its smooth test and ornamentation this form differs from the typical species. Fine concentric striæ are very numerous, many of the striæ on the flanks being sinuate. Larger flattened lamellæ or growth ridges, uneven and few in number. A further series of the small form may prove it to be a definite species, but at present owing to lack of material it must be placed with *M. minor*.

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* Single valve.

[27] Dana.—U. S. Explor. Exped. (Wilkes') Geology, 1849, x, p. 696; atlas, pl. vi, figs. 2-3.

[28] Girty.—Proc. U. S. Nat. Mus., xxvii, 1904, p. 728, pl. xlv, figs. 4-6; pl. xlvi, fig. 5.

Localities.—New South Wales: Wandrawandian and Burrier, south coast; Bundanoon Gully, S.W. of Sydney; Glendon.

Horizon.—Upper Marine series, Permo-Carboniferous.

Figured specimens.—Australian Museum collection.

Collection.—Australian Museum, Sydney.

Myonia minor Etheridge fil. var. etheridgei, var. nov.

Mœonia carinata Morris var. *minor* Eth., junr., REC. AUST. MUSEUM, xii, 1919, pl. xxx, fig. 9.

Description.—Shell transversely elongate, wedge-shaped; pointed posteriorly and more than twice as long as high. Anterior margin rounded. Dorsal margin and inferior margin parallel in the central two-thirds of valve. Umbones highest point of shell, broad and pointed, overhanging hinge line; incurved and situated in the anterior one-fourth of the shell. Escutcheon well marked and elongate. Lunule shallow. Valves moderately convex, becoming inflated at posterior extremity. A median depression or sinus extends from the base of the umbone to centre of the ventral margin. Umbonal ridge or carina strong and very sharp, extending in a gentle curve from the apex of the umbone to the extreme posterior extremity, completing the wedge-shape of the valve. Postero-dorsal slopes between the umbonal ridge and hinge line inclined steeply towards valve junction to form ligamental ridge. Hinge line straight and short.

Surface of shell covered with broad concentric ridges or growth lines and finer concentric striæ.

Dimensions.—

	F.13929.
Length	56 mm.
Height	24 mm.
Width (both valves)	18 mm.
Angle of ridge	24°

Observations.—This variety is represented in the collection by a single specimen of both valves collected at Bundanoon Gully, about ninety miles S.W. of Sydney. It was figured by Etheridge[29] as a sub-variety of *M. carinata* var. *minor* ?. No mention was made in the text of this specimen, but in the explanation of plates we read: "Possibly a sub-variety, narrower and more elongate." This specimen, which is beautifully preserved, showing no sign of distortion, is a unique form amongst the smaller species of the genus. Its extremely elongated shell, the curve of the umbonal ridge, and the wedge-shaped posterior extremity, suffice to make this variety unmistakable.

Locality.—Bundanoon Gully, N.S.W.

Horizon.—Upper Marine series, Permo-Carboniferous.

Collection.—Australian Museum, Sydney.

Myonia undata (Dana).

(Plate 1, figures 1–2.)

Pholadomya undata Dana, Amer. Journ. Arts and Sci., (2), iv, Nov., 1847, p. 153.

Pholadomya (Platymya) undata Dana, U. S. Explor. Exped. (Wilkes'), Geology, x, 1849, p. 687.

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[29] Etheridge, junr.—REC. AUSTR. MUS., xii, 1917-21, 9, pl. xxx, fig. 9.

Description.—Shell of medium size, transversely oval, obliquely gibbose, inequilateral and almost twice as long as high. Equivalve; valves slightly inflated in median line and becoming compressed towards valve extremities. Umbones distinct, slightly raised and placed forward on the anterior one-fourth of the valve. Anterior of umbone short and narrow, with rounded margin except on umbonal slope, which is straight. Posterior two-thirds of shell has a truncate or bluntly rounded extremity. Dorsal margin straight; inferior margin rounded. Hinge line straight and short. A sinus or well developed excavation extends obliquely from the umbone to the inferior margin. A ridge or carination extends from the apex of the umbones to the posterior extremity. Ridge is distinct on complete testiferous shells, but becomes rather rounded on internal casts. Postero-dorsal surface flattened, comparatively wide. Escutcheon well developed and elongate. Muscle scars slightly excavate.

Dimensions.—

	Plate 1.		
	Fig. 1. (L.631.)	Fig. 2. (F.1127.)	F.21713.
Length	76 mm.	69 mm.	61 mm.
Height	42 mm.	37 mm.	31 mm.
Width (single valve)	11 mm.	10 mm.	9 mm.
Angle of ridge	30°	30°	30°

Observations.—The specimen figured in Plate 1, figure 2, is a cast of one of Dana's types, which is at present housed in the United States National Museum, Washington. This specimen from Wollongong Point, Illawarra, was described by Dana in 1847[30] as *Pholadomya undata*, and later in 1849[31] in his more complete work as *Pholadomya (Platymya) undata*. Dana states in his observations that "the palleal impression is not seen on the specimens in the collections, of this, or either of the three following species, and we cannot say whether it has a sinus or not. We suspect the latter, in which case the species are not Pholadomyæ, and may be nearer the Mæoniæ." Additional specimens in the Australian Museum collection do not show the musculature markings, but all other characters appear to point very strongly to the Myoniæ, in which genus it has been placed. The definite sinus on the flanks of the shell and the ridge or carination and flattened postero-dorsal slopes leave little doubt that it is a *Myonia*.

Dr. F. R. Cowper Reed, in describing Permo-Carboniferous fossils from Brazil,[32] compares a single specimen with *Cardinia* ? *cuneata* (Dana),[33] and de Koninck's figure of *Mæonia elongata*.[34] An examination of the figure and Reed's description of *Mæonia* cf. *cuneata* (Dana), leads me to the conclusion that his specimen has more affinities with *Mæonia undata* (Dana) than with any other species of the genus. *Mæonia elongata* Dana (relegated to *Mæonia accentuata*) is a more or less inflated type, with a sharp posterior extremity, and is more than twice as large as the Brazilian form. *Cardinia* ? *cuneata* Dana, referred provisionally to the genus *Stutchburia* by

[30] Dana.—Amer. Journ. Arts and Sci. (2), iv, Nov., 1847, p. 153.

[31] Dana.—U. S. Explor. Exped. (Wilkes') Geology, x, 1849, p. 687; atlas, pl. ii, fig. 11.

[32] Reed.—Monographias do Servico Geologico E Mineralogico do Brazil, x, 1930, p. 37, pl. vi.

[33] Dana.—Amer. Journ. Arts and Sci., lv, 1847, p. 158; *idem.*, fig. 6. U. S. Explor. Exped. (Wilkes') Geology, x, 1849, p. 695, pl. v, figs. 3*a-c*.

[34] De Koninck.—Foss. Pal. Nouv-Galles du Sud, 1877, 3, p. 142, pl. xx, fig. 6.

Etheridge,[35] does not possess an umbonal ridge, and from the figures published by him does not possess any strong affinities with *Mœonia* cf. *cuneata* described by Reed. From the general description, *M. undata* has many points in common with Reed's specimen, particularly in the shell dimensions and the presence of a straight umbonal ridge running from the umbone to the posterior extremity.

Localities.—New South Wales: Wollongong Point; Gerringong; Illawarra district.

Horizon.—Upper Marine series, Permo-Carboniferous.

Figured specimens.—Australian Museum collection, Sydney.

Myonia fragilis Dana.

Mœonia fragilis Dana (pt.), U. S. Explor. Exped. (Wilkes'), Geology, x, 1849, pp. 696–7; atlas, pl. vi, fig. 2.

Dana's original and the only description of this species is as follows: "A sharply carinate species allied to *carinata.*" Glendon, valley of the Hunter.

Dana in his observations says that: "This large species is so much compressed and distorted that it cannot properly be characterized. The length is about 4½ inches and height 2½. It has an acute or sub-acute carina situated like that of the *rugulosa.* The surface is very coarsely and unevenly marked with concentric striæ or ridges, and the lines of the flattened flank make less than a right angle with those of the lateral surface. The shell appears to have been quite thin; portions remaining are much less than half a line in thickness. The lateral surface must have been a little flattened, and the lower margin, judging from the direction of the rugæ, was nearly or quite straight at middle."

Observations.—This species has not to my knowledge been discovered since Dana's specimen was collected at Glendon in the valley of the Hunter, New South Wales. Nothing new regarding it has appeared in literature, and it appears likely that as this form was described from distorted and much broken specimens, it may be synonymous with *carinata,* with which it is closely allied.

Locality.—Glendon, valley of the Hunter, Newcastle district, New South Wales.

Horizon.—Upper Marine series, Permo-Carboniferous.

EXPLANATION OF PLATES.

PLATE XLVII.

Myonia elongata Dana.

Fig. 1.—Internal cast of left valve, showing nodulose surface and fringed anterior adductor muscle scar.

Fig. 2.—Cast or replica of Dana's type specimen showing general outline of valve.

Fig. 3.—Partly weathered right valve, with umbonal ridge and pallial line.

Myonia accentuata, sp. nov.

Fig. 4.—Left valve slightly tilted to show flattened postero-dorsal surface.

Fig. 5.—A typical specimen showing accentuated form of posterior extremity.

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[35] Etheridge, junr.—REC. AUSTR. MUS., xii, 9, 1919, p. 190, pl. xxx, figs. 4-6.

PLATE XLVIII.

Myonia valida Dana.

Fig. 1.—Internal cast of right valve, showing heavily striated muscle scars and nodulose character of flanks.

Fig. 2.—Right valve exhibiting slight convexity in the umbonal ridge.

Fig. 3.—Cast of Dana's type specimen exhibiting outline and arched ridge.

Myonia depressa, sp. nov.

Fig. 4.—External view of left valve showing ornamentation.

Fig. 5.—Right valve showing flattened nature of the species and umbonal ridge merging with shell at inferior margin.

Myonia minor Etheridge.

Fig. 6.—Left valve of small form of *M. minor* showing strong carination.

Fig. 7.—Right valve of small form of *M. minor* exhibiting sharp carina and ornamentation.

PLATE XLIX.

Myonia carinata (Morris) Dana.

Fig. 1.—External view of right valve showing distinct ridge.

Fig. 2.—Internal cast of left valve exhibiting fringed muscle scar, heavy pallial line and nodulose structure of flank.

Fig. 3.—Cast of one of Dana's type specimens.

Myonia minor Etheridge.

Fig. 4.—Etheridge's type specimen. Note oblique angle of ridge and stumpy nature of shell.

Fig. 5.—Cast of Dana's *M. fragilis*.

Fig. 6.—Left valve of a typical specimen.

Fig. 7.—External view of right valve showing flattened compressed valve.

PLATE L.

Myonia undata (Dana).

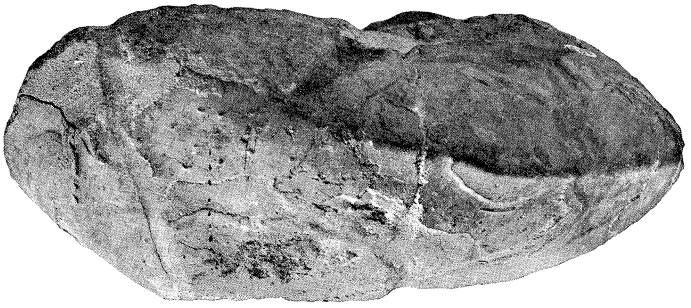
Fig. 1.—Left valve exhibiting umbonal ridge and wide postero-dorsal slope.

Fig. 2.—Cast of Dana's specimen described as *Pholadomya* (*Platymya*) *undata*.

Myonia corrugata, sp. nov.

Fig. 3.—Left valve exhibiting heavy folded carina and raised anterior adductor muscle scar.

Fig. 4.—External view of left valve showing extreme inequilateral shell and flattened postero-dorsal surface.



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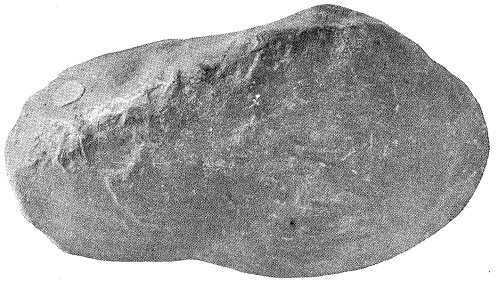

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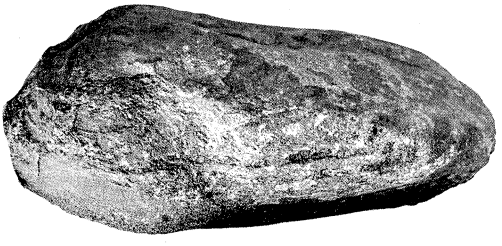

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G. C. CLUTTON, photo. 3

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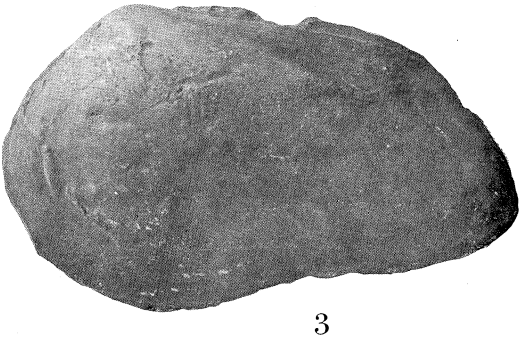

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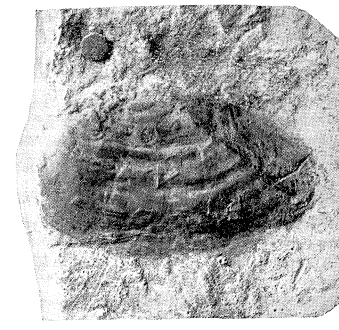

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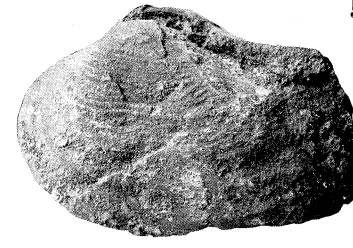

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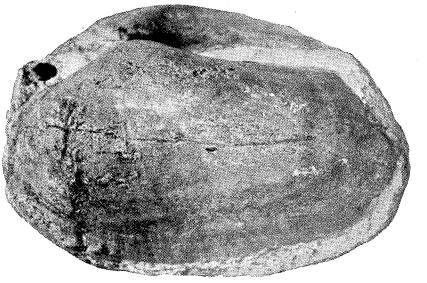

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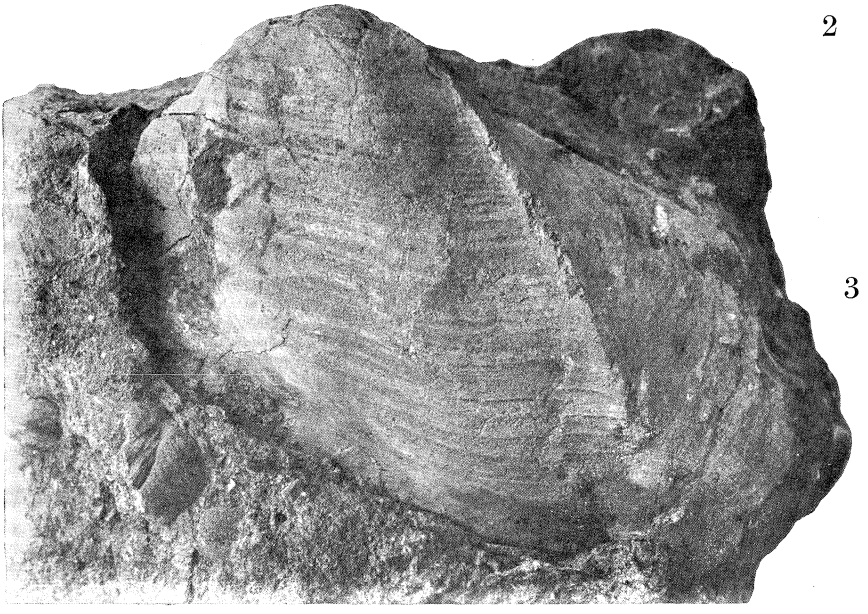

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G. C. CLUTTON, photo.